06 10 00 • ROUGH CARPENTRY

SECTION INCLUDES

06 11 00 Dimensional Wood Framing
06 12 00 Sheathing
06 13 00 Prefabricated Trusses
06 16 00 Wood Blocking
06 17 00 Engineered Wood Framing

RELATED SECTIONS

01 57 00 Construction and Demolition Waste Management
01 81 00 Energy Performance Requirements {*if section is added}*
03 30 00 Cast-In-Place Concrete (Formwork)
06 20 00 Finish Carpentry
06 50 00 Structural Plastics & Composites
06 65 00 Plastic and Composite Trim & Decking
07 62 00 Sheet Metal Flashing and Trim
07 27 00 Air Barriers

ABBREVIATIONS-TESTING, CERTIFYING AND GRADING AGENCIES

AITC- American Institute of Timber Construction www.aitc-glulam.org
ALSC- American Lumber Standards Committee www.alsc.org
ANSI- American National Standards Institute www.ansi.org
APA- The Engineered Wood Association, (formerly American Plywood Association) www.apawood.org
AWPA- American Wood Protection Association www.awpa.com
CSA- Canadian Standards Association www.csa.ca
FSC- Forest Stewardship Council www.fscus.org
NIST- National Institute for Standards and Technology www.nist.gov
SFI-Sustainable Forest Initiative www.sfiprogram.org

LOAD CALCULATIONS

DESIGN

Calculate loads and specify the fiber stress for lumber.

Avoid over-designing that will result in unnecessarily high material costs. Spruce, Pine or Fir should be adequate for most conditions; provide a rationale for any other species.

ENVIRONMENTAL ISSUES

PRODUCTS

Consider using wood from well-managed forests. The LEED systems may still require Forest Stewardship Council (FSC) certification for such wood to qualify, but there are other rating organizations as well, such as Sustainable Forest Initiative (SFI) and Canadian Standards Association (CSA). Using certified wood supports a well-managed forest industry.

Look for engineered wood products with certified wood content, recycled or recovered wood, and/or products that are produced within 500 miles of the project site. The use of engineered wood should be evaluated on a case-by-case basis as it has many different impacts on a project and on resource usage.

Use products with low VOC content and no added urea formaldehyde. Avoid excessive use of chemicals such as wood preservatives and be attentive to handling requirements for all chemicals.

ENERGY PERFORMANCE

For new construction as well as for renovations, building framing can have a large impact on a building's energy performance. The Energy Star program includes specific requirements in their "Thermal Enclosure System Rater Checklist" (www.energystar.gov/ia/partners/bldrs_lenders_raters/downloads/InspectionChecklists.pdf) for reduced thermal bridging, fully-aligned air barriers, and air sealing.

Several options for reduced thermal bridging impact rough framing design. These include continuous, rigid insulation, structural insulated panels (SIPs), insulated concrete forms (ICFs), double wall framing, and "advance framing." (www.energystar.gov/ia/home_improvement/home_solutions/doeframing.pdf) Designers should refer to the Energy Star checklist for more details.

DIMENSIONAL FRAMING

MATERIALS

The following standards apply to the grading, characteristics and design of framing lumber:

- ❑ Lumber materials must comply with the most current American Softwood Lumber Standard PS 20, published by NIST; grade stamped.
- ❑ Moisture content must not exceed 19%; *IMPORTANT!* MC15% kiln dried where cladding is to be installed.
- ❑ Species need not be specified unless there is a particular structural requirement.

Finger-jointed wood lumber is acceptable for most interior framing except for bathroom wall and floor framing. Specify labelled products, certified by an independent ALSC certified lab, by grade:

- ❑ Vertical Use Only- No. 1 or No. 2 grade for interior stud use only, where no tension loads exist
- ❑ Certified Exterior Joints- No. 1 grade for load bearing studs, headers, lintels & beams

The Contractor should submit lumber schedule to the Architect for approval.

TREATED LUMBER

BACKGROUND

The treated wood industry has been undergoing rapid change. Designers are advised to check the latest research reports through www.buildinggreen.com and other industry sources.

Chemical treatment of wood has long raised environmental concerns. By extending the life of wood exposed to weather or moisture, it conserves our wood resources. Yet, it does this at the risk of introducing toxic chemicals

into the environment, including through direct user contact and through leaching into ground water supplies or into the air when incinerated.

CCA (chromated copper arsenate) treated wood was the industry standard for several decades. It is no longer recommended for residential applications due to the possibility of ingestion through skin contact. 60 billion board feet of this product are in service. As it comes out of service, its disposal presents a major environmental hazard. Disposal of this material should be addressed in the Waste Management Plan. MassDEP requires disposal of PT wood in an approved solid waste facility.

For existing pressure treated wood products remaining in service, the EPA suggests applying penetrating coatings such as oil-based, semi-transparent stains once a year to reduce migration of wood preservative chemicals.

Alternatives to using treated lumber include naturally resistant wood, such as teak, cedar, redwood, and ipé. Other alternatives exist in the plastic and composite decking products (See Sections 06 50 00 and 06 65 00). These alternatives are typically,significantly more expensive than treated wood.

Use treated wood for:

- ❑ Interior and exterior sills on foundations and slabs
- ❑ Exterior exposed framing and covered decking.
- ❑ Wood in contact with concrete and other masonry
- ❑ Nailers in exterior masonry walls

MATERIALS

All treated wood products must carry labels identifying treatment and intended use.

Non-Preservative Treatment

Sodium silicate treated wood is a product which appears to have superior characteristics to preservative treated wood. The sodium silicate is infused into the wood and forms a layer of glass around the wood cells, deterring attack by insects and rot. It is not toxic and appears to be quite durable, although it has been in use only since 2006. It makes the wood harder, stronger and fire resistant. It is available as TimberSIL, which carries a 40 year warranty. Working with TimberSil may be somewhat more difficult due to the greater hardness. Worker protection is the same as for untreated wood.

Preservative Treatments

The following chemical preservatives are listed with the American Wood Protection Association (www.awpa.com/references/homeowner.asp), shown here with retention levels required for various uses. Information was excerpted from the AWPA website (partial listing):

		Retention Factor lb / ft^3			
Code	**Preservative Name**	**UC1, 2**	**UC3B**	**UC4A**	**UC4B**
ACC	Acid Copper Chromate	0.25	0.25	0.50	---
ACQ	Alkaline Copper Quaternary (Type B or C)	0.25	0.25	0.40	0.60
ACQ	Alkaline Copper Quaternary (Type A or D)	0.15	0.15	0.40	0.60
ACZA	Ammoniacal Copper Zinc Arsenate	0.25	0.25	0.40	0.60
CA-B	Copper Azole, Type B	0.10	0.10	0.21	0.31
CA-C	Copper Azole, Type C	0.060	0.060	0.15	0.31
CuN-W	Waterborne Copper Naphthenate	0.070	0.070	0.11	---
CX-A	Copper HDO	0.206	0.206	---	---
SBX	Inorganic Boron (Formosan termites)	0.28	---	---	---

Use Category	Brief Description
UC1	Interior Dry
UC2	Interior Damp
UC3A	Exterior Above Ground, Coated with Rapid Water Runoff
UC3B	Exterior Above Ground, Uncoated or Poor Water Runoff
UC4A	Ground Contact, General Use
UC4B	Ground Contact, Heavy Duty
UC4C	Ground Contact, Extreme Duty

Grading
Any pressure treated lumber used in an outdoor project must be grademarked by an agency accredited by the American Lumber Standard Committee (ALSC). The grademark indicates that the lumber meets the structural and appearance specifications established for the grade and has been properly seasoned prior to treatment. In addition, the lumber should have a quality mark indicating it has been treated in accordance with the standards set by the American Wood Preservation Association (AWPA). Often the AWPA seal is found on a label located at one end of the board. Typical grades used in deck construction include Select Structural (the best), No. 1 and No. 2. Most decks are built with either No. 1 or No. 2 grade lumber.

Safety Precautions
When specifying preservative-treated lumber, also specify the following worker precautions:
1. Wash hands after contact
2. Do not allow food to come in contact with the lumber
3. Do not cut the lumber in enclosed spaces

4. Wear gloves and safety goggles while working with the lumber
5. Never burn treated lumber as it emits toxic gases when burned.

Visual inspection is not an acceptable substitute for a label.

Preservative treatment must comply with AWPA C2 (lumber) and AWPA C9 (plywood). Incising is required for treatment of thin-sapwood species such as douglas-fir, spruce, hemlock and fir.

Arsenic-containing wood preservatives (CCA) are not acceptable.

Preservatives used must be EPA-registered, general use pesticides.

Alkaline Copper Quaternary (ACQ) and Copper Azole (CA) are recommended for all uses where wood will be exposed to high moisture or wet conditions (typically all exterior building components). Variants of these products, such as Micronized Copper Quaternary (MCQ) use very fine particles of copper in suspension rather than copper in solution. These products may not be listed with AWPA, although they have been tested and approved for building code requirements by the International Code Council (ICC).

Acid Copper Chromate (ACC) and Copper HDO (CX-A) are not recommended for ground contact, wet, or below ground uses.

Dipped or heavy brush-coated wood preservative is not acceptable where pressure treatment is required, except at cut ends.

Do not install aluminum flashings in contact with CA or ACQ pressure treated wood. All metal brackets used with these products must be rated for such use.

Boron (SBX) treated lumber is not acceptable for most applications
For limited applications where they are used, such as framing lumber where insect infestation may be a concern:

Borate pressure-treated wood products shall be minimum .42 DOT retention and shall carry a minimum 20 year manufacturer's warranty against termites, carpenter ants and fungal decay.

Untreated fir posts (#1 grade) are an acceptable alternative to pressure treated pine, provided post ends are not in direct contact with concrete or ground and post ends are pre-dipped for 24 -48 hours (8" minimum depth from base), in a non-water soluble, waterproof preservative.

Surface brushing is not acceptable.

Fasteners For Pressure-Treated Wood

Use either stainless steel or hot-dipped galvanized fasteners,(meeting ASTM 153) and hot-dipped galvanized connectors, (meeting ASTM- A653), for ACQ and CA pressure-treated wood, (electro-galavanized fasteners are not acceptable as they will be corroded by the chemicals).
Consider galvanic action and compatibility of fasteners with the chemicals used to treat the wood.

Where fasteners connecting structural members are exposed to high moisture, or in contact with ground or concrete, stainless steel fasteners, (Type 304) are strongly recommended

DEMISING WALLS AND INTERIOR PARTITIONS

DESIGN

For common walls between dwelling units, staggered stud walls (with a 5-1/2 inch cavity) are preferred, with a layer of gypsum drywall (5/8 inch) on each side and acoustic batt insulation woven between the studs.

Staggered stud and double stud walls must be fire-blocked as required by code, including a minimum of every ten feet horizontally. Fire blocking may be wood, gypsumboard, mineral wool batts, or other approved material. Filling the cavity with spray-applied cellulose may be an acceptable alternative. Mineral wool batts or cellulose are preferred to rigid materials which will transmit structure-borne sound.

Offset electrical outlets and other penetrations in party walls.

EXECUTION

Designer Note: Include specification requirement that the General Contractor is responsible for maintaining the integrity (including shoring) of the structure where cutting and reframing is necessary.

Panelized interior partitions are not recommended for slabs-on-grade, because they are difficult to level.

SHEATHING

MATERIALS

Plywood must be grade stamped (APA), by the Engineered Wood Association, Teco or Pittsburgh Labs and shall meet the requirements of the latest edition of Voluntary Product Standards PS-1 or PS-2.

Exterior sheathing plywood must be Exposure 1 performance-rated.

Specify sheathing to the span rating and install sheathing with the long dimension (strength axis) of panels across supports- two or more spans. These requirements must also be specified for patching and repairs.

Moisture content must not exceed 19%, kiln dried.

Provide plywood and OSB (walls only) according to the following applications:

- ❑ Roofs: 5/8 inch min., 5 ply, Douglas Fir plywood or APA sheathing, Exposure 1.
- ❑ Floors to receive resilient flooring and carpet: 5/8 inch min., 5 ply; Douglas Fir APA Rated Sheathing, Exposure 1, with 3/8 inch APA Sturd-I-Floor rated underlayment is preferred, installed with ring-shank nails; no staples.
- ❑ Southern Yellow Pine Plywood is not recommended for Sub Floors.
- ❑ Floors to receive porcelain floor tile: ¾"minimum T&G, 7-ply; Exterior grade plywood is recommended. Follow assemblies listed in latest edition of Tile Council of America Standards. At a minimum, all plywood floors where tile

is to be installed shall be t&g, glued and screwed at 8" o.c. using hot-dipped galvanized screws (typical) and stainless steel screws used at all bathroom floors.

- ❑ Floors to receive Hardwood Flooring: 3/4" minimum plywood, glued and screwed with bridging at floor joists.
- ❑ Exterior Walls: ½" min. plywood or OSB, Exposure 1. Plywood is preferred, in part because cut edges of OSB are seldom field-treated as required. Plywwod also has higher permeability, thus allowing faster drying of walls to the exterior. On the other hand, proprietary Zip System panels, which are OSB with a water-resistive coating, together with the Zip System tape, form an effective air barrier, water barrier and sheathing in one system.
- ❑ *Note: Edges of OSB must be field-treated with waterproof sealant to prevent swelling.
- ❑ *Exterior rated plywood is required for subfloors and underlayments at bathrooms.

EXECUTION

Install subfloors with construction adhesives conforming to APA Specification AFG-01 or ASTM D3498. Use adhesives that have a VOC content of 70 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24). In addition, mechanically fasten all subfloors and underlayments according to APA recommendations. Provide diagonal joist bridging for added floor stiffness and to prevent squeaking. Use screws wherever I-joists or 2x4 truss floor framing is used, and at larger spans.

Provide ply clips or continuous lumber blocking for fastening panel edges of roof sheathing.

Specify staggered panel end joints and offset joints between subfloor and underlayment. Do not align finish floor joints with intermediate underlayment joints.

BLOCKING

DESIGN

Detail blocking, or note all necessary blocking for all wall-hung hardware, plumbing fixtures, cabinets, grab bars, etc. Be sure to include blocking for the following:

- ❑ Drapery tracks to allow drapes to stack clear of the window opening
- ❑ Kitchen cabinets
- ❑ Grab bars and other accesibility items
- ❑ At the base of wheel-in showers
- ❑ Electrical fixtures, outlets, hose bibs (on exterior walls), etc.
- ❑ Between jamb stud and next stud at latch height at all doors.

For bathrooms in adaptable and fully accessible units, detail blocking for grab bars that may be added after occupancy (refer to MAAB regulations for the extent of blocking required).

Nailing ¾" plywood over studs is the preferred method of blocking because it allows installation of grab bars anywhere there is plywood, although it reduces overall room dimensions.

Detail corner framing or use drywall clips to allow wall insulation to be installed without voids

Use hot-dipped galvanized steel nails and end nailing for all blocking; do not toe-nail or nail within ½" of the edge of blocking or the supporting structural member.
Do not use staples to secure blocking

PREFABRICATED TRUSSES

MATERIALS

The fabricator's shop drawings must be stamped by a structural engineer registered in Massachusetts.

Follow structural spanning, spacing, and bracing requirements in accordance with the Building Code and Truss Institute standards.

Finger-jointed lumber must be Machine Stress Rated, (MSR)-grade- stress tested, finger-jointed wood for truss framing.

DESIGN

Detail trusses to allow for shrinkage and thermal movement and truss uplift and to prevent gypsum board separation and cracking at the ceiling and wall. Use L-shaped truss clips attached to the top of interior walls which will allow the truss to move up and down independently of the wall. Do not nail the trusses directly to any interior walls.
Trusses must be designed to be structurally stable to avoid damage during installation.

Minimum six inch truss bottom chords are preferred to ensure rigid ceilings.

Consider using raised heel roof trusses or design the pitch of the roof to accommodate the full depth of insulation and adequate ventilation

ENGINEERED WOOD FRAMING

DESIGN

The Designer should carefully evaluate which engineered wood products are appropriate based on cost-effectiveness, availability, durability and acceptance by local code officials. If any of these factors are identified as potential problems during design, the Designer should specify conventional framing. Consider listing engineered wood framing as an alternate to base bid, where appropriate.

For non-uniform loading conditions the Contractor shall provide an engineering analysis signed and stamped by a Massachusetts registered structural engineer.

STRUCTURAL GLUED-LAMINATED TIMBER (GLULAMS)

Glulams shall be APA - Engineered Wood Assocaition grade-stamped, in conformance with AITC/ANSI A190.1, American National Standard for Glued Laminated Timber.

Manufacturer's certificate of compliance required.

Glulams shall be specified for the following characteristics:

- ❑ Appearance: graded
  - "architectural" for all exposed applications;
  - "industrial" for all concealed appications.
- ❑ Additional appearance characteristics shall be per Engineered Wood Systems Technical Note EWS Y110.
- ❑ Required design stress (with or without camber)
- ❑ Maximum allowable wane
- ❑ Adhesives-based on wet or dry use
- ❑ Fire resistance (where applicable)
- ❑ Preservative treatments (when applicable) per American Wood Preservers' Association (AWPA) Standard C28

I-JOISTS

I-joists shall be grade labelled per allowable spans for uniformly loaded residential construction at various I-joist spacings

APA Performance Rated (PRI), maximum deflection of L/480, conforming with Performance Standard for APA EWS I-Joists, PRI-400. Rim Boards shall be manufactured and stamped in accordance with APA Rim Boards, PRI-401

All accessory products such as blocking panels, rim boards, squash blocks, web stiffeners, etc. shall be provided and installed in accordance with APA Performance-Rated I-Joists, Form Z725.

LAMINATED VENEER LUMBER (LVL)

Laminated veneer lumber shall be grade marked per the LVL manufacturer's published structural design values using methods established in ASTM Standard Specification D5465 for Structural Composite Lumber.

Proprietary engineered products should be carefully evaluated and specified only after availibility and cost-effectiveness have been carefully evaluated. The use of LVL's might be considered a resource efficient material. The manufacturing of LVL's does not require the harvest of old growth trees,

EXECUTION

Maintain protective covering and or sealants on glulams and I-joists during shipment, storage and handling- protect from rain and sunlight.
Where glulams are "architectural" grade, maintain protective coverings until after installation.

Seal cut ends of glulams with waterproof sealant, immediately after trimming

Store, stack and handle I-joists vertically

Do not allow workers to walk on or load I-joists until full sheathing and bracing are installed.

All damaged I-joists should be removed and replaced with new: DO NOT REPAIR DAMAGED I-JOISTS. I-joists which show evidence of excessive moisture (swelling of webs), greying due to sunlight exposure, cracking, checking or splitting, shall not be installed.

FASTENERS

In general, wood fasteners should be chosen to transfer structural loads between the members joined, to limit corrosion of the fastener and deterioration or staining of adjacent materials, and to limit the amount of deflection, particularly in floors.

BUILDING WRAP

Particularly in low-rise construction, the rough carpenters may be expected to install building wrap or another form of air and/or water barrier. It is important to refer the rough carpenter to the sections on air, water, moisture and thermal barriers in other sections.

(The following information will be moved to Section 072700)
Air and water barriers are required for all new construction, additions, and siding replacements. Air barriers may be formed of rigid materials or flexible membranes that are securely fastened to resist air pressure. In either case, continuity is important. All seams and penetrations must be sealed and all transitions from wall planes to foundations, floors, ceilings or roof planes, as well as doors and windows, must be fully detailed for a continuous barrier covering the entire building.

Particularly in low-rise construction the rough carpenters may be expected to install building wrap. A well installed building wrap can function both as a water barrier and an air barrier, thus serving two of the four building envelope functions. The other two, thermal and moisture barriers, generally fall under other sections. Building wraps are designed to be vapor permeable to allow moisture to migrate from the wall assembly to the outside.

Refer to Energy Star "Thermal Enclosure System Rater Checklist" (www.energystar.gov/ia/partners/bldrs_lenders_raters/downloads/InspectionChecklists.pdf) for specific requirements for fully-aligned air barriers. See also the Energy Star "Water Management System Builder Checklist" in the same document for required drainage plane (water barrier) behind exterior cladding.

Building wraps may be manufactured from polyethylene or polyolefin.

PRODUCTS:

- ❑ Building Wrap: ASTM E 1677, Type I air retarder; with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, when tested according to ASTM E 84; UV stabilized; and acceptable to authorities having jurisdiction.
  - Water-Vapor Permeance: Not less than 10 perms using
  - ASTM E 96, Desiccant Method (Procedure A).

- Allowable UV Exposure Time: Not less than three months.

- ❑ Building-Wrap Tape: Pressure-sensitive plastic tape recommended by building-wrap manufacturer for sealing joints and penetrations in building wrap.

- ❑ Building-Wrap Fasteners: Fasteners as recommended by the manufacturer to resist pull-through due to air pressure from the interior of the building.

INSTALLATION:

Install wraps following manufacturers instructions. Seal all seams, edges, fasteners, and penetrations with tape. Extend into jambs of openings and seal corners with tape. Wrap must be installed with manufacturer-approved fasteners or furring strips in order to resist billowing and fasterner pull-outs due to air pressure from either inside or outside. It is imperative that the wrap be protected from abuse during construction.

Seal wrap where new construction abuts existing and at all adjacent construction including roofs, foundations, windows & doors. Designer must provide details for all such conditions.

TERMITE SHIELDS

Termite shields are required by these guidelines. It is important to refer the rough carpenter to Section 07 62 00 Sheet Metal Flashing and Trim for termite shield installation requirements.

(The following information will be moved to Section 07 62 00 Sheet Metal Flashing and Trim):
Termite shields must be provided on all projects, separating concrete foundations and concrete steps from wood framing. Although the use of termite shields has not been common practice in Massachusetts, the addition of foundation insulation (which provides concealment for termite tunnels) and changing climate conditions make these shields necessary.

Termite protection has been typically provided by chemical treatment of the soil. Currently used chemicals provide effective treatment with lower toxicity for human beings and pets. Section 31 31 00 covers specifications for soil treatment. Chemical treatments are not necessarily 100% effective and need to be re-applied over time.

Good construction practice is to force termites to construct their tunnels in a manner that makes them visible. Thus, keeping wood separated from the earth helps. However, termites can enter a building through cracks as small as 1/32” in concrete foundation walls. Carefully constructed termite shields separating wood framing from concrete foundations can be effective in forcing termites into the open. The shields become especially important when rigid insulation is installed on the exterior of the foundation, or when any type of insulation or finish is installed on the inside. These features provide excellent termite paths that are totally concealed from inspectors, unless an effective shield forces the termites into the open.

Termite shields must be carefully constructed to be effective. The following recommendations are copied from the website of RLC Engineering, LLC (www.rlcengineering.com/csspecs.htm):

> "7) Termite protection shall be provided by pre-treatment and by incorporation of corrosion-resistant metallic termite shield between the top of foundation walls/piers and the mud sill. The metallic termite shield shall extend to the exterior at least 1 inch past the finish wall material and to the inside at least one (1) inch past the expected width of foundation wall insulation.
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> "8) Joints in the termite shield shall be permanently fused with solder (or equivalent) or overlapped a minimum of 6 inches and sealed with a rubberized asphalt sheet membrane at least 6 inches wide. Penetrations through the termite shield for anchor bolts, etc. shall be sealed with a minimum 6 inch square of rubberized asphalt sheet material between the termite shield and the mud sill. Rubberized asphalt material shall be a minimum of 35 mils thick with adhesive surfaces on both sides. (Example: MFM Building Products "Double Bond" material)
>
> "9) Caulk or sill sealer shall be installed between the top of the foundation wall and the termite shield, and between the termite shield and the mud sill. The joint between the mud sill and the band joist shall be caulked or similarly sealed."